Nuclear Safety Workshop

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Working Together to Enhance Nuclear Safety

DOE's Approach to Nuclear Facility Safety Analysis and Management

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U.S. DEPARTMENT OF ENERGY

Overview

- U.S. Department of Energy (DOE) Safety Management Regulatory Framework
- Safety Analysis
  - Hazard Analysis
  - Accident Analysis
  - Hazard Control Identification
- Probabilistic Risk Assessment
- Important Concepts and Issues

DOE Safety Management Regulatory Framework

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- Nuclear Safety Policy
- Nuclear Safety Rule
  - Safety Analysis
  - Quality Assurance
- Nuclear Safety Orders
  - Facility Design
  - Conduct of Operations, Maintenance, Training
  - Readiness Review

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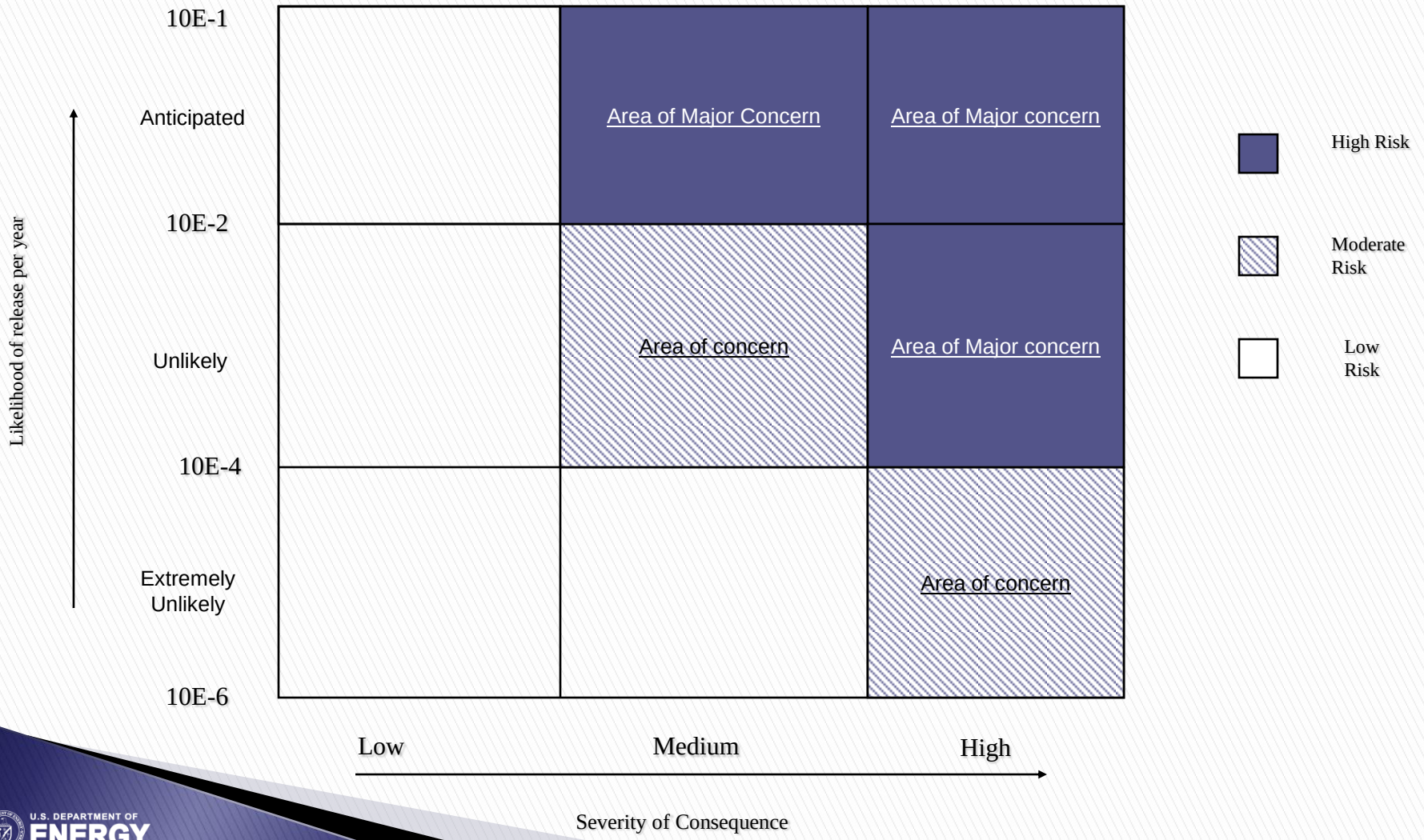
Hazard Assessment

- Diversity of DOE Facilities Types
- Use of Center for Chemical Process Safety Guides
- Outcomes
  - Risk Matrix
  - Potential Hazard Controls for In facility Workers
  - Accident Types to be further analyzed

Risk Ranking and Binning



Accident Analysis

- Technique
  - Accident Types
  - Bounding Analysis
- Input Parameters
  - Material at Risk
  - Damage Ratio, Airborne Release Fraction
  - Site Meteorological and Terrain Parameters
- Outputs
  - Estimate of Unmitigated Consequences
  - Estimate of Mitigated Consequences

Hazard Controls

- Receptors
  - Public
  - Co-Located Worker
  - Facility Worker
- Types
  - Safety Class/Safety Significant
  - Specific Administrative Controls
- Hierarchy of Controls

Probabilistic Risk Assessment

- Nuclear Safety Policy Addresses Use of Probabilistic Risk Assessment (PRA)
- Draft Standard for Interim Use and Comment
- Potential Applications
- Establishment of Risk Working Group

Benefits/Costs with increased use of QRA/PRA

- Benefits
  - Higher level of safety assurance
  - Use of Qualitative Risk Assessment (QRA) for preventative controls versus mitigative controls
  - Understanding importance of controls
  - Defining Design Basis Accidents
- Costs
  - Cost of development
  - Cost of maintenance
  - Over reliance on output
- Ensure right application

DOE Challenges with increased use of QRA/PRA

- Ensuring appropriateness and adequacy of tools
- Ensuring adequacy of data
- Developing standard/guidance for
  - Performance of QRA
  - Quality Assurance of QRA
  - Peer Review of QRA
- Establishing appropriate support infrastructure

Important Issues and Concepts

- Adequate Protection
- Defense in Depth
- Multiple Layers of Protection
- Design Basis versus Evaluation Basis
- Beyond Design Basis
- Dispersion Analysis
- Bounding versus Reasonably Conservative